

# ROTATING ELECTRIC MACHINE AND ITS MANUFACTURE

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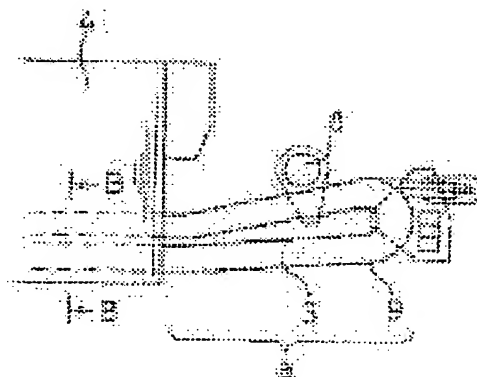
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## Abstract of JP 5328649 (A)

**PURPOSE:** To obtain a rotating electric machine suited for outdoor use such as an electric motor for pump and for vehicle by obtaining an electrical insulated coil with improved moisture resistance and water resistance by simple material and method.

**CONSTITUTION:** A fluorine paint is coated, at least on a part exposed toward the side of a core 4 of an insulated coil 3. Therefore, a hydrophobic layer utilizing the water resistance effect of fluorine atom can be uniformly provided on the surface of the insulated coil, thus obtaining an electrical insulated coil and a rotating electric machine with improved moisture resistance and water resistance.



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CLAIMS

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[Claim(s)]

[Claim 1]It is a dynamo-electric machine which has an insulated wire ring inserted in said slot with a gestalt which a part exposes to the side of an iron core and the aforementioned iron core which has a slot for inserting an insulated wire ring, A dynamo-electric machine which an insulating layer is formed and is characterized by a thing of an insulated wire ring for which a fluorine system paint is applied to the outermost layer of said exposed part at least when said insulated wire ring winds an insulating film or a mica tape.

[Claim 2]A manufacturing method of a dynamo-electric machine characterized by comprising the following.

An iron core which has a slot for inserting an insulated wire ring.

An insulated wire ring is prepared for inserting in said slot with a gestalt which a part exposes to the side of the aforementioned iron core, A process of inserting said insulated insulated wire ring in said iron core, performing varnish treated if needed, and applying a fluorine system paint to an exposed portion of said insulated wire ring at least after forming an insulating layer by winding an insulating film or a mica tape around said insulated wire ring.

[Claim 3]A manufacturing method of a dynamo-electric machine characterized by comprising the following.

An iron core which has a slot for inserting an insulated wire ring.

Prepare an insulated wire ring for inserting in said slot with a gestalt which a part exposes to the side of the aforementioned iron core, and by winding an insulating film or a mica tape around said insulated wire ring, form an insulating layer, and if needed, perform varnish treated and it ranks second, A process of inserting a fluorine system paint in said insulated wire ring, and inserting said insulated insulated wire ring in said iron core after \*\*\*\*\*.

[Translation done.]

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to a dynamo-electric machine which can be suitably operated under the condition as which dynamo-electric machines, such as an induction motor and an electric motor for vehicles, and a manufacturing method for the same are started, for example, especially moisture resistance and a water resisting property are required, and a manufacturing method for the same.

[0002]

[Description of the Prior Art]The insulation of the electrical-insulated-wires ring of a dynamo-electric machine was improved by development of an exotic material every year, and improvement in reliability has been achieved. However, if the induction motor for pumps, the main motor for vehicles, etc. are compared with the common induction motor etc. which some which are used outdoors in many cases and used in the atmosphere of high humidity have, and are installed indoors, their operating environment is cruel. For this reason, as for the dynamo-electric machine used under such conditions, high reliability is required about moisture resistance and a water resisting property. Especially the insulation of the electrical-insulated-wires ring used there is an important technical technical problem.

[0003]As a manufacturing method of the electrical-insulated-wires ring of the dynamo-electric machine for applying to these conventionally, as shown in the JP,58-72348,A gazette, As it includes in an iron core and is indicated to the method with which it is really impregnated, and the conventional technology of Japanese Patent Application No. 62-277425, after forming a thermal melting arrival type hydrophobic insulating layer in the outside of a mica insulating layer and forming a heat contraction nature insulating layer on it, The iron core which has a slot which inserts the winding which provided the insulating layer, and said winding in a conductor, In the manufacturing method of the dynamo-electric machine which carries out being varnish impregnated by one after comprising the slot established in the periphery side of said slot, and the wedge inserted in said slot and combining these, since said winding is fixed, How to prevent the outflow of a varnish

certainly by applying the curing catalyst of an impregnating varnish to the whole field of a wedge which touches an iron core slot at least before being varnish impregnated, Or in the electrical-insulated-wires ring really manufactured by an impregnating method, it is known in \*\*\*\*\* which serves as a canal insulating layer by adopting the method of carrying out varnish treated twice, the method of carrying out rotation hardening, etc., and thickening the layer of an impregnating varnish.

[0004]As shown in JP,58-182443,A, from the purpose of reducing the stress in the case of the heat contraction of the coil within the slot of the iron core of the huge rotator of a dynamo-electric machine like a steam turbine generator, and preventing generating of the plastic deformation of a coil. In the rotator of the dynamo-electric machine which has a coil which is dedicated by the slot of a rotor core and supported with a wedge via an insulating block in the radial direction side, what provided the fluoro-resin coating layer in the coil surface is known.

[0005]

[Problem(s) to be Solved by the Invention]However, in order to require the work which adds \*\*\*\*\* work to a mica tape insulation, and twists hydrophobic insulating tape further in order to form a hydrophobic insulating layer, a great material cost and routing counter are needed. In addition to working efficiency being insufficient, the method which performs the method with which a varnish is impregnated twice, and rotation desiccation had a fault, like furnishing becomes large-scale.

[0006]What provided the fluoro-resin coating layer in the coil surface within the slot of the iron core of the huge rotator of a steam turbine generator, a basis -- a basis raising the slide nature between two or more coils located in the insulating block which is main insulation, and a slot armor, and, It is what is made in order to prevent generating of the plastic deformation of the coil according the stress which this generates in the case of the heat contraction of a coil to mitigation or a centrifugal force, It was difficult to apply the art to apparatus which an insulated wire ring exposes to the side of the iron core like a stator of a dynamo-electric machine like an induction motor or the electric motor for vehicles as it is.

[0007]The purpose of this invention the whole electrical-insulated-wires ring of the dynamo-electric machine of a gestalt which an insulated wire ring exposes to the side of an iron core, or by forming a hydrophobic layer in said exposed portion by simple material and a simple method at least, It is in providing providing the dynamo-electric machine excellent in moisture resistance and a water resisting property, and a manufacturing method for the same.

[0008]

[Means for Solving the Problem]In order to solve the above-mentioned technical problem and to attain the purpose, this invention, It is a dynamo-electric machine which has an insulated wire ring inserted in said slot with a gestalt which a part exposes to the side of an iron core and the aforementioned iron core which has a slot for inserting an insulated wire ring, Said insulated wire ring indicates a dynamo-electric machine which an insulating layer

is formed and is characterized by a thing of an insulated wire ring for which a fluorine system paint is applied to the outermost layer of said exposed part at least by winding an insulating film or a mica tape.

[0009]An iron core which has a slot for this invention to insert an insulated wire ring, An insulated wire ring is prepared for inserting in said slot with a gestalt which a part exposes to the side of the aforementioned iron core, After forming an insulating layer by winding an insulating film or a mica tape around said insulated wire ring, Said insulated insulated wire ring is inserted in said iron core, varnish treated is performed if needed, and a manufacturing method of a dynamo-electric machine having the process of applying a fluorine system paint to an exposed portion of said insulated wire ring at least is also indicated.

[0010]A fluorine system paint which has water repellence as a modification of the above-mentioned manufacturing method after winding an insulating film or a mica tape around an insulated wire ring is applied, and it may be made to make it include an insulated wire ring which formed this insulating layer after that in an iron core. It may be made to perform varnish treated if needed before a process of applying a fluorine system paint.

[0011]

[Function]Since a fluorine system paint can be diluted and applied with a suitable solvent, even if it is a thing of complicated shape like an insulated wire ring, can apply to that surface uniformly, and when this fluorine system paint dries, further, The characteristic that an interaction with an external substance (for example, water) peculiar to the fluorine atom contained there is very small can be given to the surface of an insulated wire ring. Since in other words the existing water-repellent surface layer is formed in the surface of an insulated wire ring, a damp-proof and waterproof good electrical-insulated-wires ring can be obtained, and the dynamo-electric machine which can be suitably operated as a result under the condition as which moisture resistance and a water resisting property are required can be obtained.

[0012]

[Example]It explains referring to the drawing of attachment of one example of this invention below. Drawing 5 shows the manufacture flow chart of the electrical-insulated-wires ring 3 by this invention. In this example, the coil conductor 1 which was carried out with [ two ] glass coating copper wire, and was carried out with the multiple-times (5 times) volume was fabricated in the shape shown in drawing 1. Next, as shown in drawing 2, the polyester film lining mica tape as insulating tape was made the outside of the coil conductor 1 made into said shape with [ 3 times ] in 1/duplex as the insulating layer 2, further, the glass tape was wound once around the outside in 1/duplex, the insulating layer was formed, and the insulated wire ring 3 was formed.

[0013]Subsequently, as the iron core 4, the straw liner 6 made of polyamide paper, and the wedge 7 manufactured with the epoxy glass laminate sheet are prepared and it is shown in drawing 3 and drawing 4, It is a gestalt which exposes the method portion a of both sides of

said insulated wire ring 3 (only the 1 side is shown in drawing 3) to the side of the iron core 4, and inserted in two or more slots 5 formed in said insulated wire ring 3 iron core 4. On that occasion, the slot liner 6 was infixed between the peripheral wall of the slot 5, and the insulated wire ring 3, and the wedge 7 was inserted in the periphery sewer of each slot 5. Next, connect in an iron core heel and insulated wire ring 3 comrade inserted in each slot 5 as the binding thing 8, The same mica tape as the insulating layer 2 of the insulated wire ring 3 was made the ring made from SUS with [ 1 time ] in 1/duplex, what made the glass tape the outside with [ 1 time ] in 1/duplex further, and insulated was attached, varnish treated was performed once by stillness desiccation, and the varnish was stiffened.

[0014]The appropriate back painted by applying a fluorine system paint (for example, Bonn Flon #1000 by Asahi Glass coat and resin incorporated company) by a spray over the iron core 4 and the whole insulated wire ring 3 grade, and the electrical machinery insulated wire ring 9 was manufactured. The dynamo-electric machine was manufactured by the usual method below using the above-mentioned iron core 4 and the electrical machinery insulated wire ring 9.

[0015]on the other hand, in order to check the effect of this invention, the dynamo-electric machine with the electrical-insulated-wires ring corresponding to the moisture resistance by the conventional system which carried out varnish treated twice and made it the canal insulating layer in order to thicken the layer of an epoxy impregnating varnish was manufactured instead of the fluorocarbon resin coating to the thing of the same composition as the aforementioned example. Next, the insulating property after wet heat degradation of the electrical-insulated-wires ring both dynamo-electric machine was evaluated. After degradation conditions carried out ten cycles of 200 °C/malarial malaria degradation+40 °C/95%RH/20h moisture absorption degradation as 1 cycle and made both the electrical-insulated-wires ring the flooded condition after 10 cycles for 24 hours, they measured flood abortion marginal resistance. In this result, both checked that the insulation resistance 24 hours after after flood had not less than 2000 M omega.

[0016]From the above result, it checked that the dynamo-electric machine which has an electrical-insulated-wires ring which has sufficient moisture resistance and a water resisting property by the simple method of applying a fluorine system paint could be provided in this invention. Also about the thing of the independent pouring method which this invention is not limited to the one above-mentioned example, carries out the varnish treated of the insulated wire ring independently, for example, and is built into an iron core after that. How to build [ to apply a fluorine system paint, after carrying out the varnish treated of the insulated wire ring independently, and ] into an iron core after that. Or after carrying out the varnish treated of the insulated wire ring independently really like an impregnating method, a fluorine system paint is applied to an iron core and the whole insulated wire ring after including in an iron core, and it will be understood easily that the purpose of this invention can be attained also by the method which manufactures an electrical-insulated-wires ring.

[0017]Also with raw materials, such as a slot liner and a wedge, not only the above-

mentioned thing but all the raw materials used conventionally can be used as they are, and, in short, can be variously carried out in the range which does not change the gist of this invention.

[0018]

[Effect of the Invention] Since the hydrophobic layer which utilized the water-repellent operation of a fluorine atom can be uniformly provided in the surface of an insulated wire ring by a simple material and the simple method of applying a fluorine system paint according to this invention, Moisture resistance and a water resisting property can obtain a good electrical-insulated-wires ring easily, and it becomes possible to obtain a suitable dynamo-electric machine for this to use it in the atmosphere of high humidity outdoors like the induction motor for pumps, or the main motor for vehicles again.

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[Translation done.]



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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]The top view of an insulated wire ring common to conventional technology and one example of this invention.

[Drawing 2]The sectional view by AA line of drawing 1.

[Drawing 3]The part plan of the dynamo-electric machine by this invention.

[Drawing 4]The sectional view by BB line of drawing 3.

[Drawing 5]The manufacture flow chart of an electrical-insulated-wires ring.

[Description of Notations]

1 [ -- An iron core, 5 / -- A slot, 6 / -- A slot liner, 7 / -- A wedge, 5 / -- A binding thing, 9 / -- Electrical-insulated-wires ring ] -- A coil conductor, 2 -- An insulating layer, 3 -- An insulated wire ring, 4

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[Translation done.]

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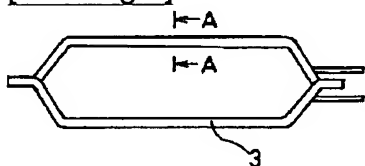
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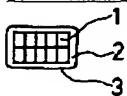
DRAWINGS

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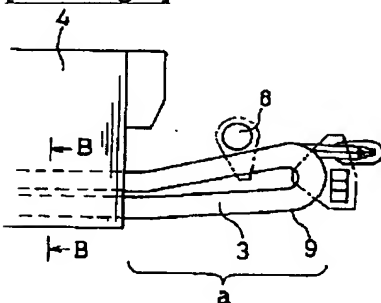
[Drawing 1]



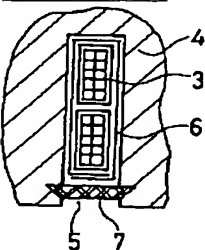
[Drawing 2]



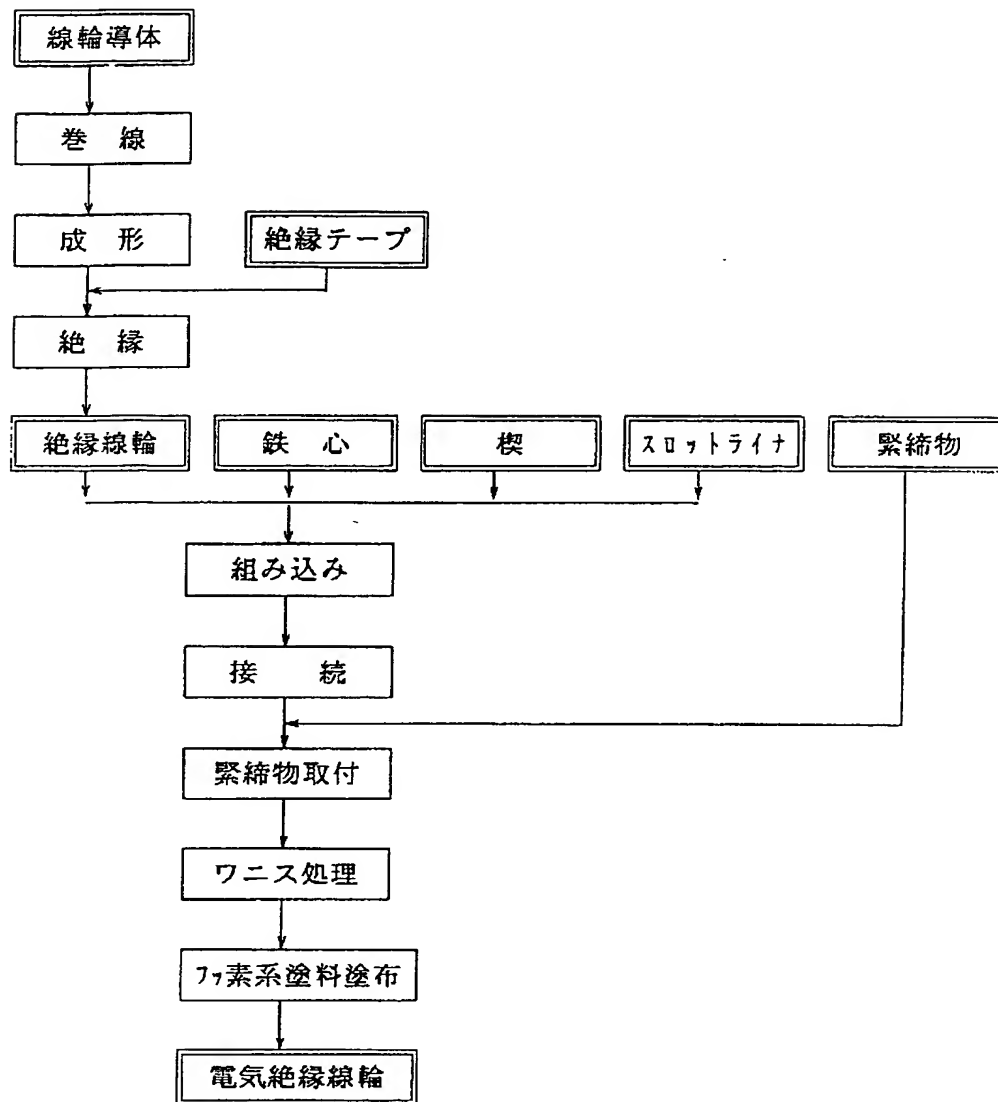
[Drawing 3]



[Drawing 4]



[Drawing 5]



本発明の実施例の製造フローチャート

[Translation done.]

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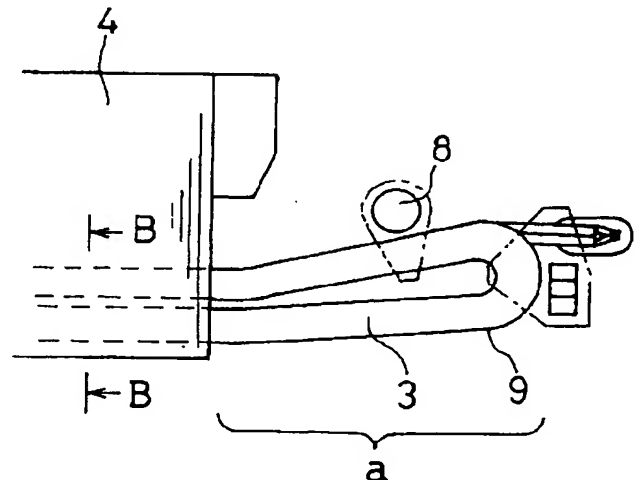
(54)【発明の名称】 回転電機及びその製造方法

(57)【要約】

【目的】 簡便な材料及び簡便な方法により耐湿性、耐水性の良好な電気絶縁線輪を得、それによりポンプ用電動機及び車両用電動機等屋外で使用するのに好適に回転電機を得る。

【構成】 絶縁線輪3の少なくとも鉄心4の側方に露出した部分aにフッ素系塗料を塗布する。

【効果】 絶縁線輪の表面にフッ素原子の撥水作用を活用した疎水性層を均一に設けることができるため、耐湿性、耐水性が良好な電気絶縁線輪及び回転電機を得ることができる。



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## 【特許請求の範囲】

【請求項 1】 絶縁線輪を挿入するためのスロットを有する鉄心、前記の鉄心の側方に一部が露出する形態で前記スロットに挿入される絶縁線輪とを有する回転電機であって、前記絶縁線輪は絶縁フィルムまたはマイカテープを巻回することにより絶縁層が形成されており、かつ、絶縁線輪の少なくとも前記露出部の最外層にフッ素系塗料が塗布されていることを特徴とする回転電機。

【請求項 2】 絶縁線輪を挿入するためのスロットを有する鉄心と、前記の鉄心の側方に一部が露出する形態で前記スロットに挿入される絶縁線輪とを用意し、前記絶縁線輪に絶縁フィルムまたはマイカテープを巻回することにより絶縁層を形成した後、前記鉄心に前記絶縁された絶縁線輪を挿入し、必要に応じてワニス処理を施し、少なくとも前記絶縁線輪の露出部分にフッ素系塗料を塗布する工程を有することを特徴とする回転電機の製造方法。

【請求項 3】 絶縁線輪を挿入するためのスロットを有する鉄心と、前記の鉄心の側方に一部が露出する形態で前記スロットに挿入される絶縁線輪とを用意し、前記絶縁線輪に絶縁フィルムまたはマイカテープを巻回することにより絶縁層を形成し、必要に応じてワニス処理を施し、次いで、前記絶縁線輪にフッ素系塗料を塗布した後、前記鉄心に前記絶縁された絶縁線輪を挿入する工程を有することを特徴とする回転電機の製造方法。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、例えば誘導電動機、車両用電動機等のような回転電機及びその製造方法に係り、特に耐湿性、耐水性が要求される条件下において好適に運転することのできる回転電機及びその製造方法に関する。

## 【0002】

【従来の技術】回転電機の電気絶縁線輪の絶縁は新材料の開発により年々改良され信頼性向上が図られてきた。しかし、ポンプ用の誘導電動機や車両用の主電動機等は屋外で使用されることが多く、高湿度の雰囲気で使用されるものもあり、屋内に設置されている一般の誘導電動機等と比較すると使用環境が苛酷である。このため、このような条件の下で使用される回転電機は、耐湿性及び耐水性に関し高い信頼性が要求される。特に、そこに用いられる電気絶縁線輪の絶縁は重要な技術課題である。

【0003】従来、これらに適用するための回転電機の電気絶縁線輪の製造法として、特開昭 58-72348 公報に示されているように、マイカ絶縁層の外側に熱融着形疎水性絶縁層を形成し、その上に熱収縮性絶縁層を形成した後、鉄心に組み込み、一体含浸する方法、特願昭 62-277425 の従来技術に記載されているように、導体に絶縁層を設けた巻線と、前記巻線を挿入するスロットをもつ鉄心と、前記巻線を固定するために前記

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スロットの外周側に設けた溝と、前記溝に挿入する楔とから成り、これらを組み合わせた後、一体でワニス含浸する回転電機の製造方法において、ワニス含浸前に楔の少なくとも鉄心溝と接する面全体に含浸ワニスの硬化触媒を塗布することにより、ワニスの流出を確実に防止する方法、あるいは、一体含浸方式で製造する電気絶縁線輪においては、ワニス処理を 2 回実施する方法や回転硬化させる方法等を採用し含浸ワニスの層を厚くすることにより疎水絶縁層を兼ねること等が知られている。

10 【0004】さらには、特開昭 58-182443 号公報に示されるように、タービン発電機のような回転電機の長大な回転子の鉄心のスロット内のコイルの熱収縮の際の応力を軽減しコイルの塑性変形の発生を防止する目的から、回転子鉄心のスロットに納められかつ半径方向側を絶縁ブロックを介して楔で支持されるコイルを有する回転電機の回転子において、コイル表面にフッ素樹脂コーティング層を設けるようにしたものも知られている。

## 【0005】

20 【発明が解決しようとする課題】しかしながら、疎水性絶縁層を形成するために疎水性絶縁テープを巻付る作業はマイカテープ絶縁に加えてさらに巻き付けの作業を要するために、多大な材料費と工程数を必要としている。また、ワニスに 2 回含浸する方法や回転乾燥を行う方式は作業効率が不十分であることに加え、設備が大掛りとなる等の欠点を有していた。

30 【0006】また、タービン発電機の長大な回転子の鉄心のスロット内のコイル表面にフッ素樹脂コーティング層を設けたものは、もともとが主絶縁である絶縁ブロック及びスロットアーマ内に位置する複数個のコイル間の滑り性を向上させ、それによりコイルの熱収縮の際に発生する応力を軽減あるいは遠心力によるコイルの塑性変形の発生を防止する目的でなされているものであり、その技術をそのまま誘導電動機や車両用電動機のような回転電機の固定子のように、その鉄心の側方に絶縁線輪が露出するような機器に対して適用することは困難であった。

40 【0007】本発明の目的は、鉄心の側方に絶縁線輪が露出する形態の回転電機の電気絶縁線輪の全体あるいは少なくとも前記露出部分に疎水性層を簡便な材料及び簡便な方法で形成することにより、耐湿性、耐水性に優れた回転電機を提供すること及びその製造方法を提供することにある。

## 【0008】

50 【課題を解決するための手段】上記の課題を解決しかつ目的を達成するために、本発明は、絶縁線輪を挿入するためのスロットを有する鉄心、前記の鉄心の側方に一部が露出する形態で前記スロットに挿入される絶縁線輪とを有する回転電機であって、前記絶縁線輪は絶縁フィルムまたはマイカテープを巻回することにより絶縁層が形

成されており、かつ、絶縁線輪の少なくとも前記露出部の最外層にフッ素系塗料が塗布されていることを特徴とする回転電機を開示する。

【0009】また、本発明は、絶縁線輪を挿入するためのスロットを有する鉄心と、前記の鉄心の側方に一部が露出する形態で前記スロットに挿入されるに絶縁線輪とを用意し、前記絶縁線輪に絶縁フィルムまたはマイカテープを巻回することにより絶縁層を形成した後、前記鉄心に前記絶縁された絶縁線輪を挿入し、必要に応じてワニス処理を施し、少なくとも前記絶縁線輪の露出部分にフッ素系塗料を塗布する工程を有することを特徴とする回転電機の製造方法をも開示する。

【0010】上記の製造方法の変形例として、絶縁線輪に絶縁フィルムまたはマイカテープを巻回した後に、撥水性を有するフッ素系塗料を塗布し、その後に該絶縁層を形成した絶縁線輪を鉄心に組み込むようにするにしてもよい。また、フッ素系塗料を塗布する工程以前に必要なに応じてワニス処理を施すようにしてもよい。

【0011】

【作用】フッ素系塗料は適当な溶剤で希釈し塗布することが可能なため、絶縁線輪のような複雑な形状のものであってもその表面に均一に塗布することができ、さらに、このフッ素系塗料が乾燥することにより、そこに含有されているフッ素原子に特有の外部物質（例えば水）との相互作用が極めて小さな特性を絶縁線輪の表面に与えることができる。言い換えれば撥水性のある表面層が絶縁線輪の表面に形成されるため耐湿性、耐水性の良好な電気絶縁線輪を得ることができ、結果として、耐湿性、耐水性が要求される条件下においても好適に運転することのできる回転電機を得ることができる。

【0012】

【実施例】以下本発明の一実施例を添付の図面を参照しつつ説明する。図5は本発明による電気絶縁線輪3の製造フローチャートを示している。この実施例においては、ガラス被覆銅線を2本持ちにして複数回（5回）巻付した線輪導体1を図1に示す形状に成形した。次に図2に示すように前記形状にした線輪導体1の外側に絶縁層2として絶縁テープとしてのポリエステルフィルム裏打マイカテープを1/2重ね3回巻付し、さらに、その外側にガラステープを1/2重ね1回巻回して絶縁層を形成し、絶縁線輪3を形成した。

【0013】次いで、鉄心4、ポリアミド紙製のストローライナ6、エポキシガラス積層板にて製作した楔7、を用意し、図3及び図4に示すように、前記絶縁線輪3の両側方部分a（図3においてはその一側方のみを示している）を鉄心4の側方に露出する形態で、前記絶縁線輪3鉄心4に形成した複数のスロット5に挿入した。その際に、スロット5の周壁と絶縁線輪3との間にはスロットライナ6を介装し、各スロット5の外周側溝に楔7を挿入した。次に、各スロット5に挿入した絶縁線輪3

同志を鉄心外端部にて接続し、緊締物8として、SUS製のリングに絶縁線輪3の絶縁層2と同一のマイカテープを1/2重ね1回巻付し、さらにその外側にガラステープを1/2重ね1回巻付し絶縁したものを取付し、静止乾燥にて1回ワニス処理を行いワニスを硬化させた。

【0014】しかるのち、フッ素系塗料（例えば旭硝子コートアンドレジジン株式会社製ボンフロン#1000）を鉄心4及び絶縁線輪3等の全体にわたってスプレーにて塗布することで塗装し、電機絶縁線輪9を製造した。上記の鉄心4及び電機絶縁線輪9を用い、以下通常の方法により回転電機を製造した。

【0015】一方、本発明の効果を確認するために、前記の実施例と同様の構成のものに対して、フッ素樹脂塗料の代りに、エポキシ含浸ワニスの層を厚くする目的でワニス処理を2回実施して疎水絶縁層とした従来方式による耐湿性対応電気絶縁線輪を持つ回転電機を製造した。次に、両者の回転電機の電気絶縁線輪の湿熱劣化後の絶縁特性を評価した。劣化条件は、200℃/4日熱劣化+40℃95±5%RH/20h吸湿劣化、を1サイクルとして10サイクル実施し、10サイクル後に両電気絶縁線輪を24時間浸水状態とした後に、浸水中絶縁抵抗を測定した。この結果では、両者とも浸水後24時間後の絶縁抵抗は2000MΩ以上を有していることを確認した。

【0016】以上の結果より、本発明においては、フッ素系塗料を塗布するという簡便な方法により、十分な耐湿性、耐水性を有する電気絶縁線輪を持つ回転電機を提供できることを確認した。なお、本発明は上記した一実施例に限定されるものではなく、例えば、絶縁線輪を単独でワニス処理し、その後鉄心に組み込む単独注入方式のものについても、絶縁線輪を単独にワニス処理した後、フッ素系塗料を塗布して、その後鉄心に組み込む方法あるいは、一体含浸方式と同様に絶縁線輪を単独にワニス処理した後鉄心に組み込み後、フッ素系塗料を鉄心、絶縁線輪全体に塗布し、電気絶縁線輪を製造する方式でも、本発明の目的を達成できることは容易に理解されよう。

【0017】また、スロットライナー、楔等の素材についても、上記のものに限らず、従来用いられている素材はすべてそのまま利用できるものであり、要は、本発明の要旨を変更しない範囲で種々実施することができるものである。

【0018】

【発明の効果】本発明によれば、フッ素系塗料を塗布するという簡便な材料及び簡便な方法で絶縁線輪の表面に、フッ素原子の撥水作用を活用した疎水性層を均一に設けることができるため、耐湿性、耐水性が良好な電気絶縁線輪を容易に得ることができ、それにより、ポンプ用の誘導電動機や車両用の主電動機のように屋外でまた高湿度の雰囲気で使用するのに好適な回転電機を得るこ

とが可能となる。

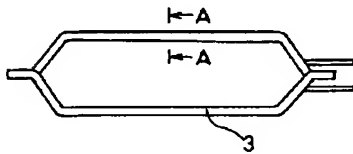
【図面の簡単な説明】

【図 1】 従来技術及び本発明の一実施例に共通な絶縁線輪の平面図。

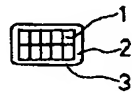
【図 2】 図 1 の A A 線による断面図。

【図 3】 本発明による回転電機の部分平面図。

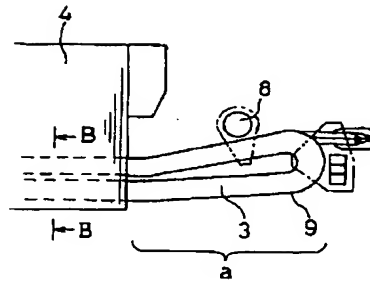
【図 1】



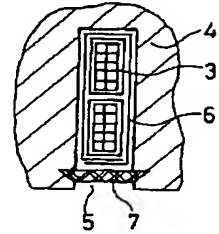
【図 2】



【図 3】



【図 4】



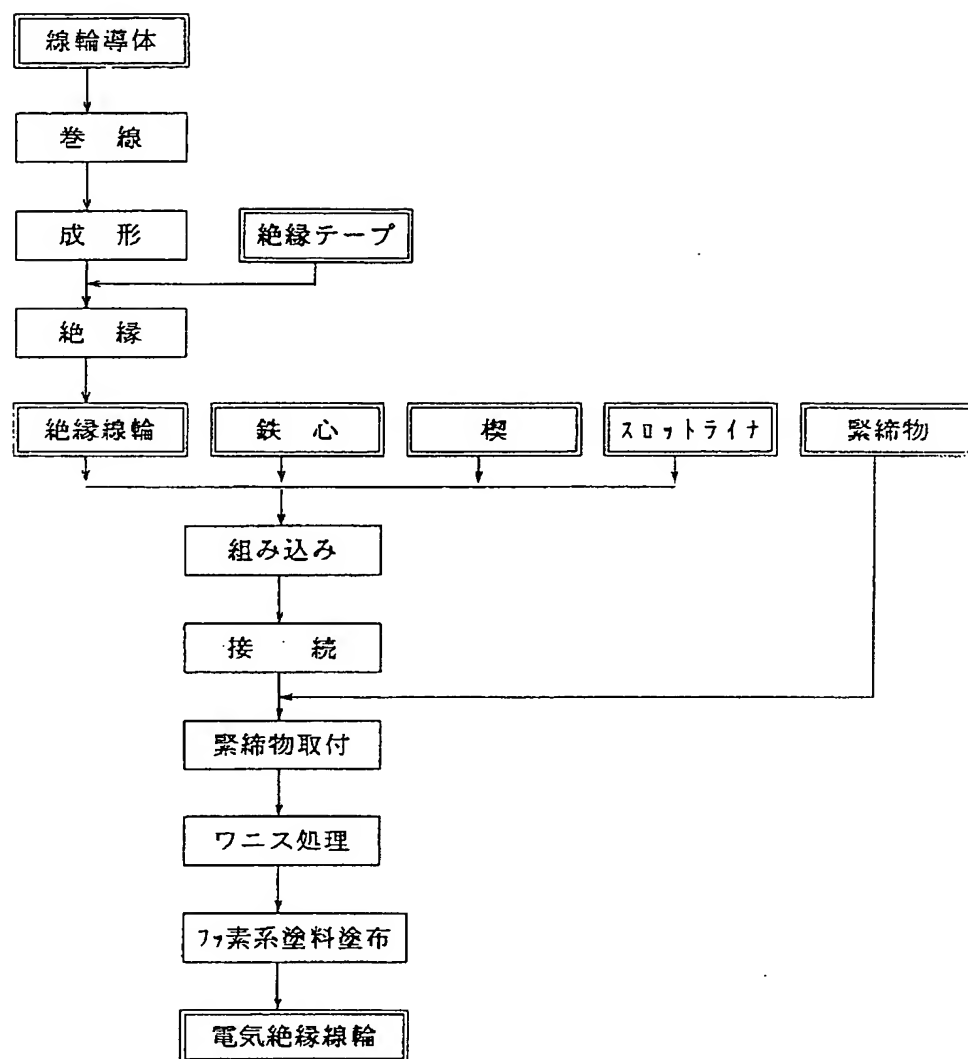
【図 4】 図 3 の B B 線による断面図。

【図 5】 電気絶縁線輪の製造フローチャート。

【符号の説明】

1…線輪導体、2…絶縁層、3…絶縁線輪、4…鉄心、  
5…スロット、6…スロットライナ、7…楔、5…緊締  
物、9…電気絶縁線輪

【図 5】



本発明の実施例の製造フローチャート

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